Abandoned Uranium Mine Assessment for the Haystack Section 31 Site (NM0103)

FINAL REPORT

Prepared For:

New Mexico Energy, Minerals and
Natural Resources Department
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INTERA

October 5, 2010

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1.0 INTRODUCTION

INTERA Incorporated (INTERA) has prepared this Abandoned Uranium Mine (AUM) Site Assessment Report for the Mining and Minerals Division (MMD) of the New Mexico Energy, Minerals and Natural Resources Department (EMNRD) in compliance with the Professional Service Agreement dated November 2, 2009. INTERA visited the Haystack Section 31 Mine Site (AUM Site), MMD ID: NM0103, on September 17, 2010.

1.1 PREVIOUSLY KNOWN INFORMATION ABOUT THE SITE

The AUM Site is located in the Poison Canyon Trend Mining District. According to Anderson (1980), the AUM site consists of several open pits and prospecting trenches, the largest of which is 150 ft wide by 325 ft long, and up to 12 ft deep (Anderson, 1980). Anderson reports scintillometer responses up to 3,000 cps (1980). Several small deposits in the Todilto Sandstone, exposed at the surface at the AUM Site, were explored and mined from 1953 to 1962 (Anderson, 1980).

1.2 SITE LOCATION AND DIRECTIONS

The AUM Site is located on private land in the N ½ of Section 31, Township 13 North, Range 9 West. This AUM Site is located in McKinley County and is approximately 14 miles north of the town of Grants (Figure 1).

To reach the AUM Site from Albuquerque, drive approximately 83 miles west on Interstate 40. Take Exit 79 toward NM-122/NM-605, Milan/San Mateo. Turn right on Horizon Boulevard, continue approximately 1,000 feet and turn left on U.S. 66 and continue approximately 0.2 miles. Turn right onto NM-605. Continue on NM-605 for 10.6 miles. Turn left onto County Road 23, also Haystack Road, and pull off the road to the left. Access to the site can be gained by walking due south, and crossing a barbed wire fence. Note that permission from the private landowner is required to cross the fence and view the Site.

1.3 SITE GEOLOGY

The AUM Site is located on a small ridge about 2 miles south of Mesa Montanosa, on the eastern side of the Colorado Plateau and the southeastern edge of the San Juan Basin. The AUM Site is in the middle and lower parts of the Todilto limestone (Anderson, 1980). The Todilto limestone is an organic rich limestone, deposited in an arid coastline environment on top of the permeable Entrada Sandstone (Finch and McLemore, 1989). The overlying sands of the Summerville or Wanakah formation locally deformed the Todilto muds, producing intraformational folds in the limestone (Finch and McLemore, 1989). Uranium mineralization occurred when uranium rich groundwater encountered organic material within the intraformational folds (Finch and McLemore, 1989).

1.4 SITE HYDROGEOLOGY

The AUM Site is located on the Todilto limestone-capped bench (Anderson, 1980). The surface runoff flows northeast, into a small ephemeral drainage. The discharge from this small drainage

flows into a small catchment pond near the intersection of Hwy 605 and Co Rd 23. Here, runoff will either seep into the ground or flow south to San Mateo Creek during heavy rainfall events. San Mateo Creek flows south-southwest to the Rio San Jose. Rio San Jose is an intermittent stream that flows east-southeast past the town of Grants and into the Rio Puerco. The Rio Puerco is also an intermittent stream that flows southeast into the Rio Grande south of Belen.

The AUM Site is located in the Bluewater groundwater basin, which covers the south central portion of McKinley County and the north central portion of Cibola County (Edwards and Kiely, 2004). The Bluewater Basin contains a patchwork of groundwater aquifers, though the most productive is the San Andres-Glorieta Aquifer (Edwards and Kiely, 2004). Many domestic and stock wells utilize groundwater in the alluvium of surface drainages but the majority of potable groundwater comes from the San Andres-Glorieta Aquifer, including the town of Grants' municipal supply (Edwards and Kiely, 2004).

1.5 REGIONAL TOPOGRAPHY AND TERRAIN

The AUM Site can be found on the Dos Lomas Quadrangle 7.5 minute United States Geological Survey topographic map at an elevation of approximately 6900 feet above mean sea level (Figure 2). The AUM Site is located on a Todilto limestone-capped bench approximately 2 miles south of Mesa Montanosa in McKinley County. The broader region around the AUM Site consists of mesas and broad flat valleys. An aerial photograph of the terrain surrounding the AUM Site is shown in Figure 3.

2.0 MINE FEATURES

The mine features described below are based on the features provided to INTERA by MMD in the GIS Data Dictionary (MMD, 2009). INTERA marked the locations of the AUM Site features using a Trimble Global Positioning System (GPS) and entered details about the features into the GPS using the MMD data dictionary. The AUM Site consists of three waste piles, three exploration pits, and two exploration trenches. Please see the Photo Log provided in Appendix A for photos, Table 1 for the locations of the AUM Site features, and Figures 4a and 4b for the locations of the AUM Site features.

2.1 MINE SHAFTS, ADITS, AND DECLINES

No mine shafts, adits, or declines were identified at the AUM Site.

2.2 MINING AND EXPLORATION PITS AND OPEN CUTS

Three exploration pits (Pit-1, -2, and -3) and two exploration trenches (Trench-1 and -2) were identified at the AUM Site. Pit-3, the largest exploration pit, is approximately 20 ft deep, 200 ft wide, and 500 ft long. Pit-2 measured approximately 10 ft deep, 150 ft wide, and 400 ft long. Pit-1 measured approximately 10 ft deep, 200 ft wide, and 400 ft long. Two trenches were found approximately 600 ft west of Pit-3 (see Figures 4a and 4b). Trench-1 measured approximately 3 ft deep, 10 ft wide, and 60 ft long. Trench-2 measured approximately 3 feet deep, 12 ft wide, and 50 ft long. The maximum gamma radiation measurement for these features was 700 µR/hr

(microroentgens per hour) at 0 ft above ground at radiation survey point Rad-6 (see Table 2) recorded at Pit-1. Radiation survey point Rad-6 was taken on small, black minerals in the limestone (see Photo 8 in Appendix A). A gamma radiation measurement taken at Trench-2 was recorded at 350 µR/hr at 0 ft above ground at radiation survey point Rad-12 (see Table 2).

2.3 WASTE AND ORE PILES AND DISTURBANCES

Three waste piles (PilePly-1, -2, and -3) were identified at the AUM Site. PilePly-3 is the largest of these features, measuring 5 ft tall, 40 ft wide, and 90 ft long. PilePly-3 consisted of several smaller piles and was excavated from Trench-1 and Trench-2. PilePly-1 and PilePly-2 are located on the south and east edges of Pit-1and appear to be composed of waste rock associated with the excavation of Pit-1. The maximum gamma radiation measurement for these features was 42 µR/hr (microroentgens per hour) at 0 ft above ground at radiation survey point Rad-10, taken at PilePly-3 (see Table 2).

2.4 MINING RELATED BUILDINGS AND FOUNDATIONS

No mining related buildings or foundations were identified at the AUM Site.

2.5 OTHER MINE FEATURES

No other mine features were identified at the AUM Site.

2.6 BOREHOLES

No boreholes were identified at the AUM Site.

2.7 RECLAMATION ACTIVITIES

No reclamation activities were identified at the AUM Site.

3.0 ARCHEOLOGICAL SITES

No apparent archeological sites were identified at the AUM Site.

4.0 SITE GAMMA RADIATION READINGS

The background gamma radiation reading at the AUM Site was measured approximately 600 ft northeast of the AUM Site. The background gamma readings were measured at 12 microroentgens per hour (µR/hr) at 0 ft above ground and 11 µR/hr at 4 feet above the ground surface. Please see Table 2 for all the gamma radiation readings taken at the AUM Site and Figures 4a and 4b for the locations of the radiation readings.

The gamma radiation readings taken at the AUM Site were significantly above background levels at two radiation survey points, Rad-6 and Rad-12 (see Table 2 and Figures 4a and 4b). The maximum reading at the AUM Site was recorded along the north wall of Pit-1 (radiation

survey point Rad-6) and was measured at 700 µR/hr at the ground surface. The other notable gamma radiation reading taken at Trench-2 (radiation survey point Rad-12) measured 350 µR/hr at 0 ft above ground surface.

5.0 CURRENT LAND USES

5.1 HUMAN ACTIVITY AND RECREATIONAL SITE USE

The AUM Site is located in land used for grazing, cattle prints and droppings were observed throughout the AUM Site and surrounding areas.

5.2 NEARBY RESIDENTIAL, COMMERCIAL AND INDUSTRIAL STRUCTURES

One residential structure is within the 1-mile radius of the AUM Site. This residence is located about 800 ft north of the west end of the AUM location boundary provided by MMD (see Figure 3).

5.3 NEARBY DOMESTIC WELLS

There are three domestic wells within a 1-mile radius of the AUM Site. One well is located about 650 ft north of the AUM Site the other two wells are located about 1300 ft east of the AUM Site. The wells were drilled from 1977 to 2002 with a depth of 54 to 580 ft and a depth to water of 30 to 280 ft.

5.4 EVIDENCE OF GRAZING OR AGRICULTURE

Fences, corrals, and cattle in the area attest to active ranching activity. One irrigation well is within a 1-mile radius of the AUM Site, located about 1200 ft east southeast of the center of the AUM Site.

5.5 EVIDENCE OF WILDLIFE

Jack rabbits and ravens, as well as deer and rabbit droppings were observed in the area surrounding the AUM Site.

6.0 VEGETATION

The AUM Site is located in the Juniper Savannah (Ecotone) vegetation type (Dick-Peddie, 1999). The dominant woody species include Utah juniper and fourwing saltbush. Grasses species include blue grama and galleta grass. Annual forb species were Russian thistle and little hogweed. There was no evidence of noxious weeds at the AUM Site.

7.0 POTENTIAL OFFSITE IMPACTS

7.1 EROSION

No evidence of mine related erosion was observed at the AUM site.

7.2 ENVIRONMENTAL IMPACTS

There is no evidence of soil staining from chemicals or from constituents present in the ore or waste rock at the AUM Site.

8.0 REFERENCES

Anderson, Orin J., 1980. Abandoned or Inactive Uranium Mines in New Mexico. New Mexico Bureau of Mines and Mineral Resources Open File Report 148.

Edwards, Mark H. and Jeffrey Kiely, 2004. New Mexico Water Planning Region 6, Cibola/McKinley Regional Water Plan. Prepared for: The New Mexico Interstate Stream Commission; Prepared by: Northwest New Mexico Council of Governments, Gallup, New Mexico.

Dick–Peddie, William A, 1999. New Mexico Vegetation: Past, Present, and Future. University of New Mexico Press.

Finch, W. I. and McLemore, V. T., 1989, Uranium geology and resources of the San Juan Basin; *in* Coal, uranium, and oil and gas in Mesozoic rocks of the San Juan Basin: Anatomy of a giant energy-rich basin: 28th International Geological Congress, Field Trip Guidebook T120, p. 27-32.

Hilpert, L., 1969, Uranium Resources of NW New Mexico, U.S.G.S., Prof. Paper 603, p. 35.

McLemore, Virginia T., 1983. Uranium and Thorium Occurrences in New Mexico: Distribution, Geology, Production, and Resources with Selected Bibliography, New Mexico Bureau of Mines & Mineral Resources, Open-file Report 183, pp. 1-21.

Mining and Minerals Division (MMD), 2009. Mine Feature Data Dictionary.

New Mexico Office of the State Engineer (NMOSE), 2008. Wells and Surface Diversions in New Mexico. WATERS_PODS_may08.shapfile. OSE Waters Database.

TABLES

Table 1
Site Features

Haystack Section 31-NM0103
Abandoned Uranium Mine Assessments

Feature Name	On Site?	Feature Type	Associated Feature	Material	Height or Depth (ft)	Width or Diameter (ft)	Length (ft)	Open	Collapsed	Closure Type	Associated Photos	Notes
PilePly-1	Yes	Waste	--	Rock	5	40	80	--	--	--	NM0103_002 NM0103_003	--
PilePly-2	Yes	Waste	--	Rock	10	40	60	--	--	--	NM0103_005	--
PilePly-3	Yes	Waste	--	Rock	5	40	90	--	--	--	NM0103_013	--
Pit-1	Yes	Exploration	--	--	10	200	400	--	--	--	NM0103_006 NM0103_007	--
Pit-2	Yes	Exploration	--	--	10	150	400	--	--	--	NM0103_009 NM0103_010	--
Pit-3	Yes	Exploration	--	--	20	200	500	--	--	--	NM0103_011 NM0103_012	--
Trench-1	Yes	--	--	--	3	10	60	--	--	--	NM0103_014	--
Trench-2	Yes	--	--	--	3	12	50	--	--	--	NM0103_015	--

Notes:

-- designates no information

Table 2
Gamma Radiation Survey Results

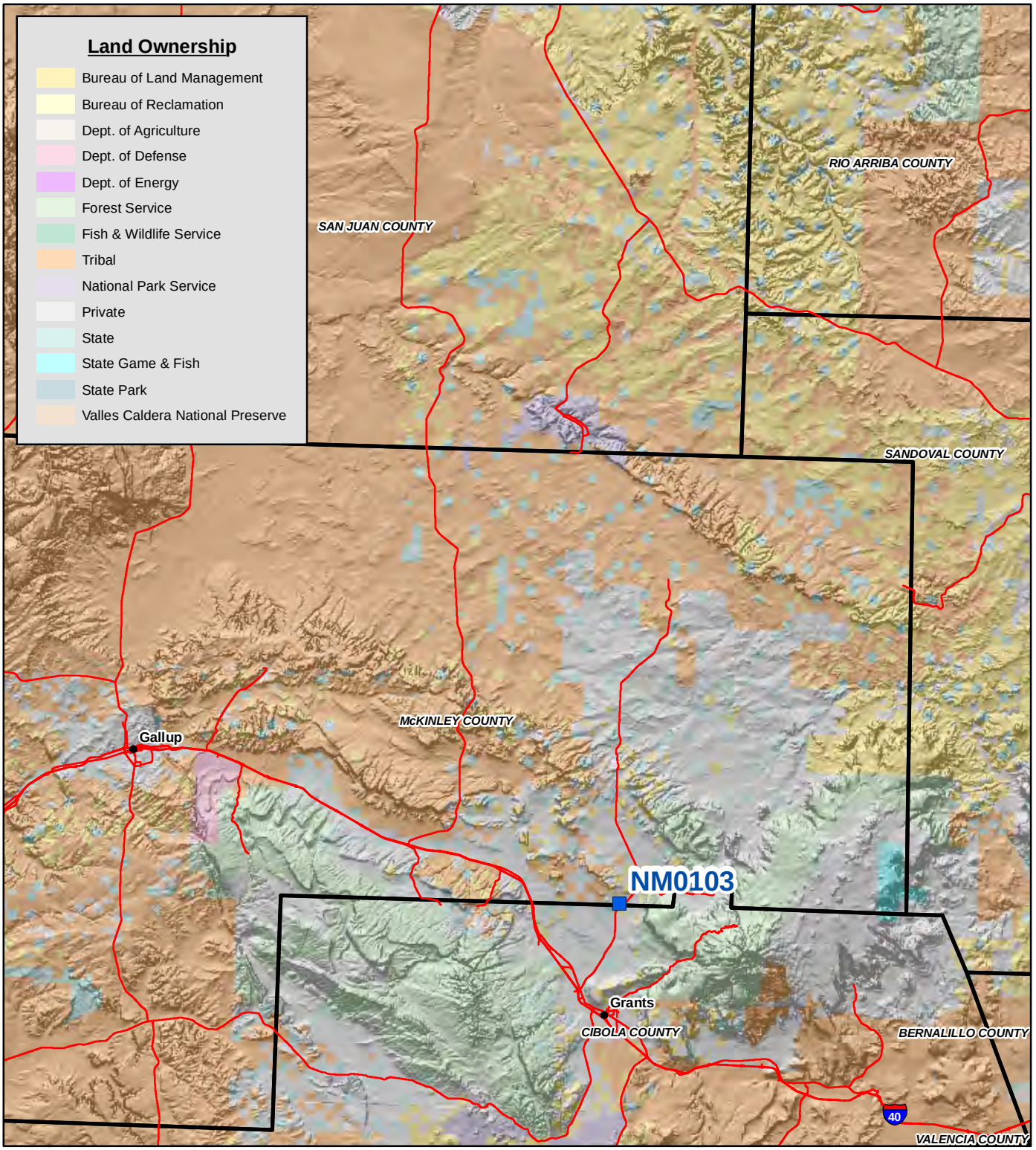
Haystack Section 31-NM0103
Abandoned Uranium Mine Assessments

Reading ID	Associated Features	0 ft (µR/hr)	4 ft (µR/hr)	Associated Photos
Rad-1	pileply-1	14.00	13.00	--
Rad-2	pileply-2	9.00	8.00	--
Rad-3	pit-1	12.00	10.00	--
Rad-4	pit-1	37.00	12.00	--
Rad-5	pit-1	10.00	9.00	--
Rad-6	pit-1	700.00	18.00	NM0103_008
Rad-7	pit-2	11.00	9.00	--
Rad-8	pit-3	8.00	8.00	--
Rad-9	pit-3	8.00	8.00	--
Rad-10	pileply-3	42.00	31.00	--
Rad-11	trench-1	70.00	26.00	--
Rad-12	trench-2	350.00	130.00	--
RadBack-1	--	12.00	11.00	--

Notes:

All gamma readings at this site taken by Ludlum 192 µR/Ratemeter
µR/hr=microroetgens per hour
-- designates no information

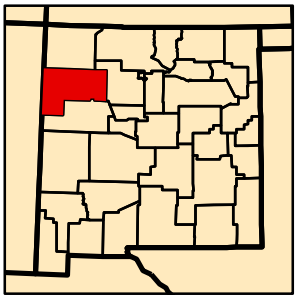
FIGURES



Map Source(s):
Ownership - BLM, 2008

0 7.5 15 30
Miles

NORTH



Legend

- AUM Location
- Road
- County Boundary

Figure 1
Site Location Map
NM0103-Haystack
Section 31
Abandoned Uranium Mine Assessment

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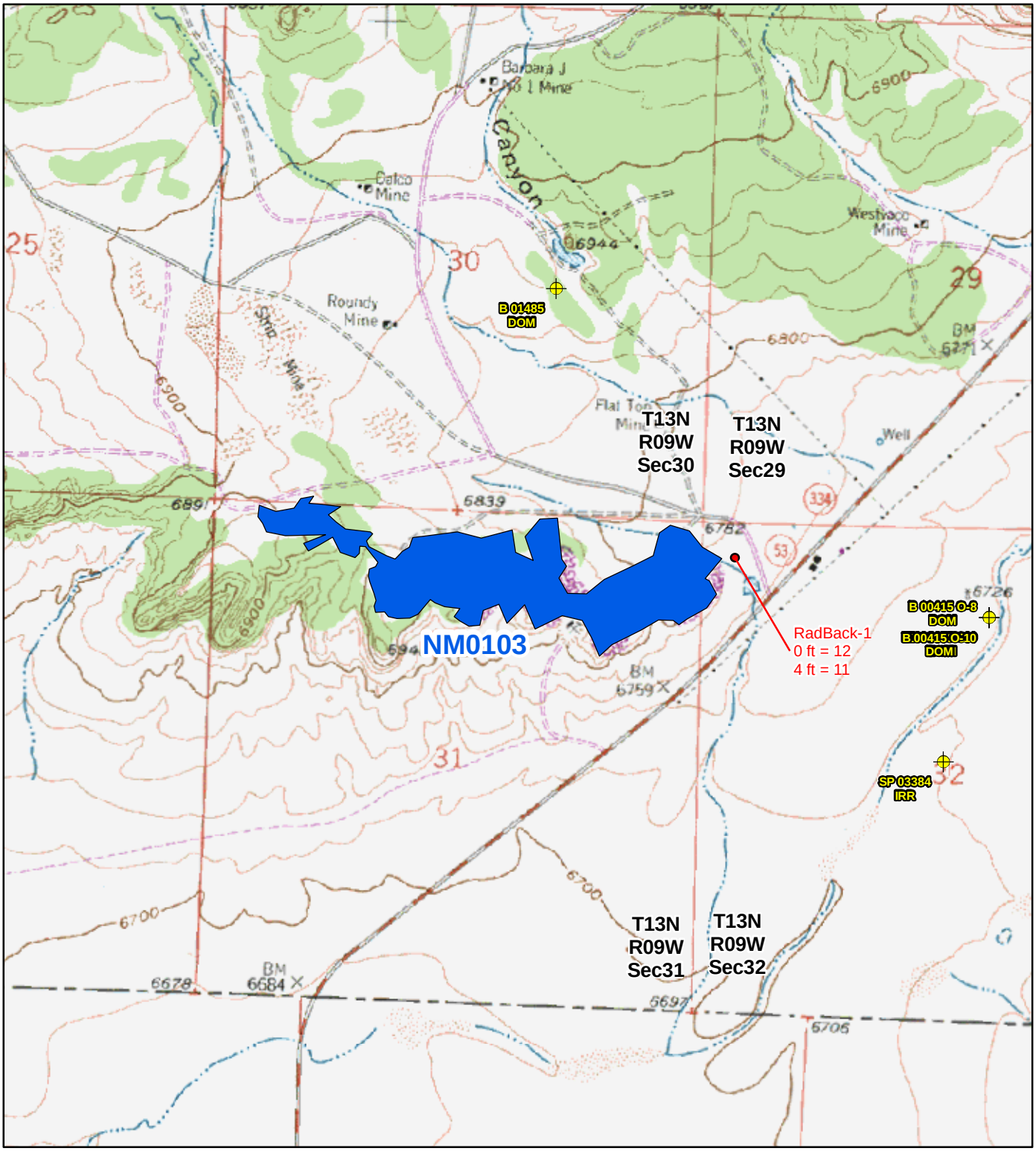

Map Source(s):
U.S. Geological Survey 7.5-Minute
Topographic Map
-Dos Lomas, 1980

0 750 1,500 3,000
Feet

NORTH

Legend

- Radiation Readings (µR/hr)
- Well Within 1 Mile of Site
- AUM Location Boundary (MMD Provided)

Figure 2
Topographic Map
NM0103-Haystack
Section 31
Abandoned Uranium
Mine Assessment

INTERA

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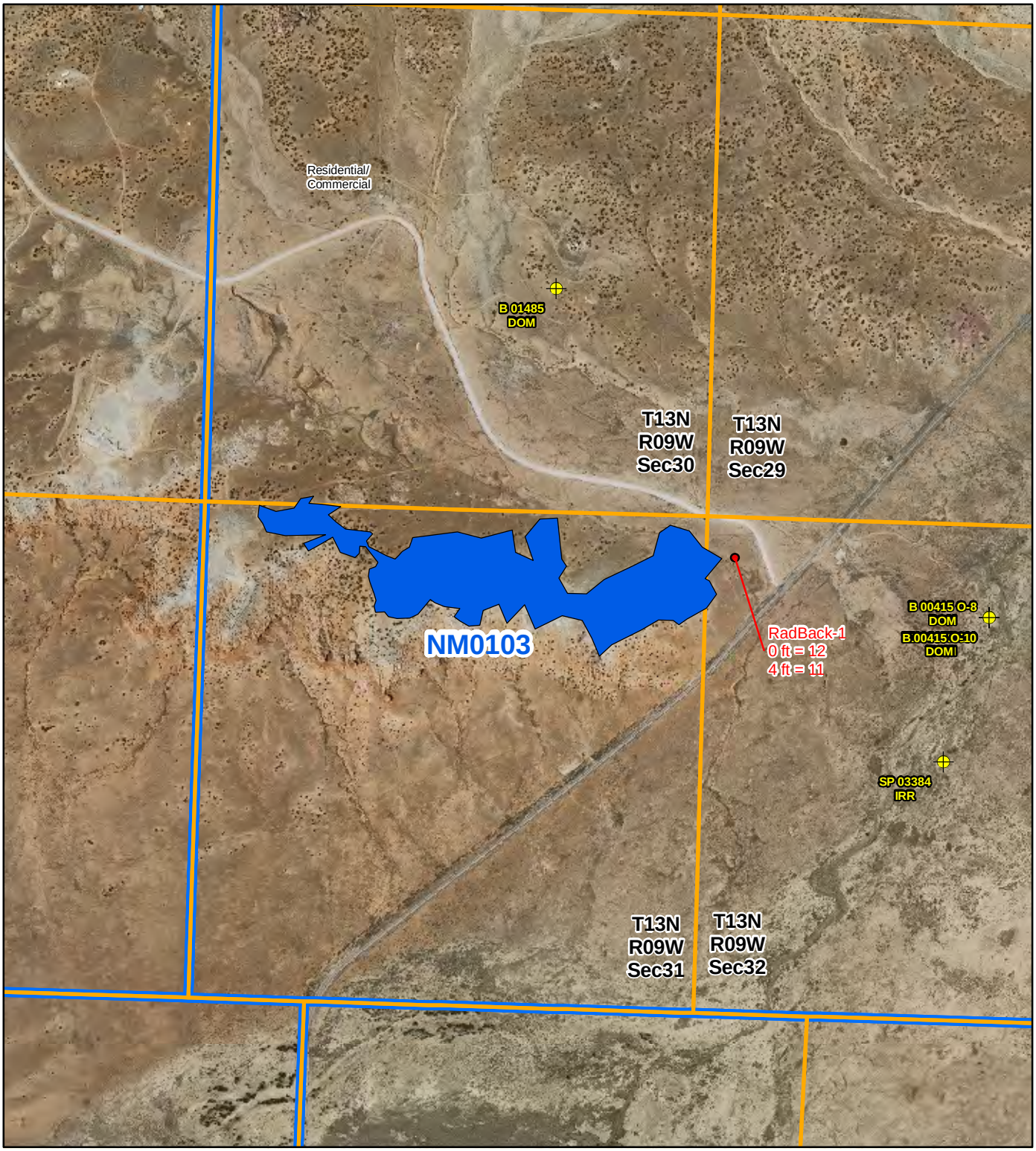

Map Source(s):
U.S. Geological Survey 7.5-Minute
DOQQ County Mosaic
-Cibola County, 2009
-McKinley County, 2009

0 750 1,500 3,000
Feet

NORTH

Legend

- Radiation Readings (µR/hr)
- Well Within 1 Mile of Site
- AUM Location Boundary (MMD Provided)
- Section Boundary
- Township/Range Boundary

Figure 3
Aerial Photo
NM0103-Haystack
Section 31
Abandoned Uranium
Mine Assessment

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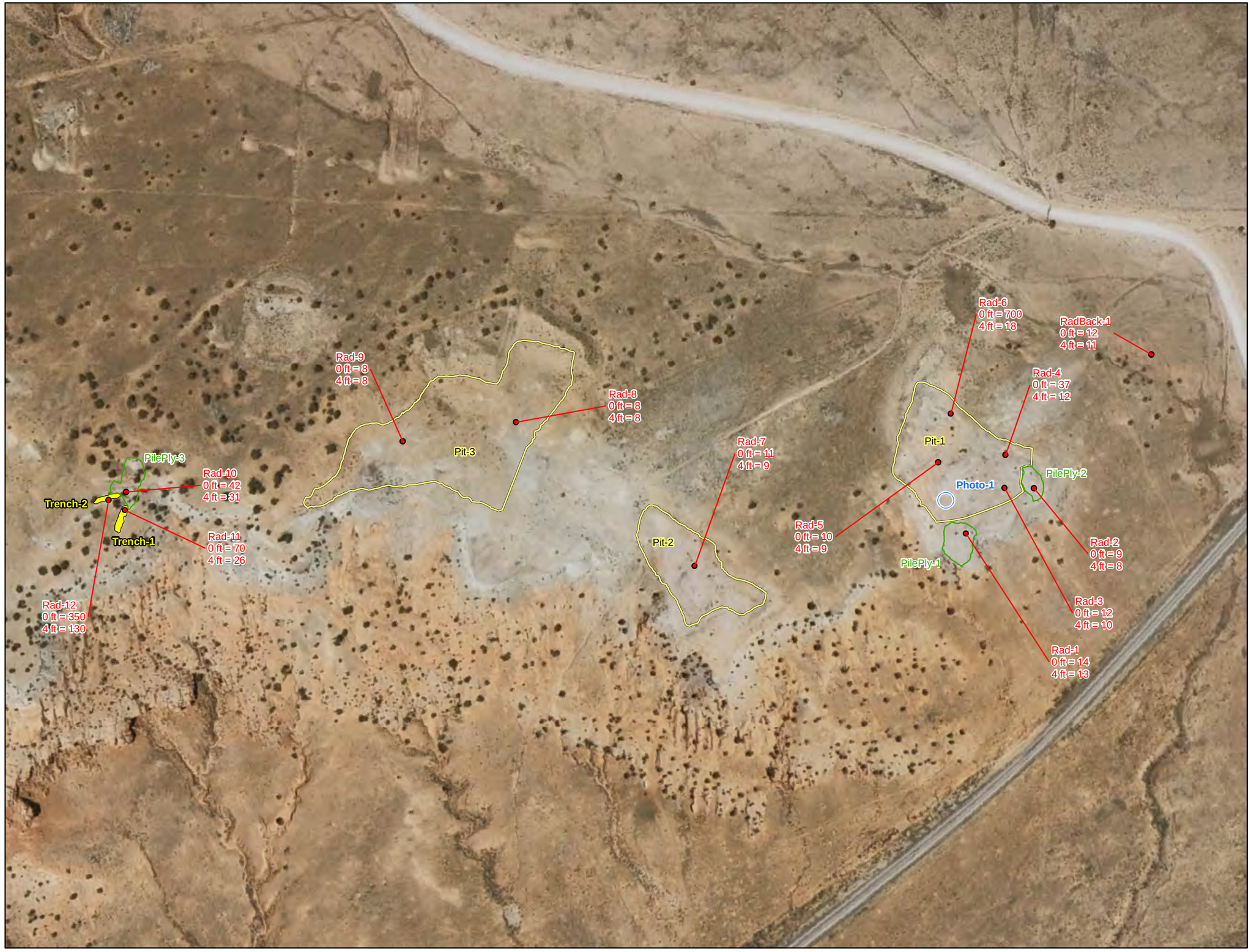

Legend

- Radiation Readings (µR/hr)
- Photo Location
- Pile Boundary
- Pit Boundary
- Trench

0 150 300 600

Feet

NORTH

Map Source(s):
U.S. Geological Survey 7.5-Minute
DOQQ County Mosaic
-Cibola County, 2009
-McKinley County, 2009

Figure 4a
Site Map on
Aerial Photo
NM0103-Haystack
Section 31
Abandoned Uranium
Mine Assessment

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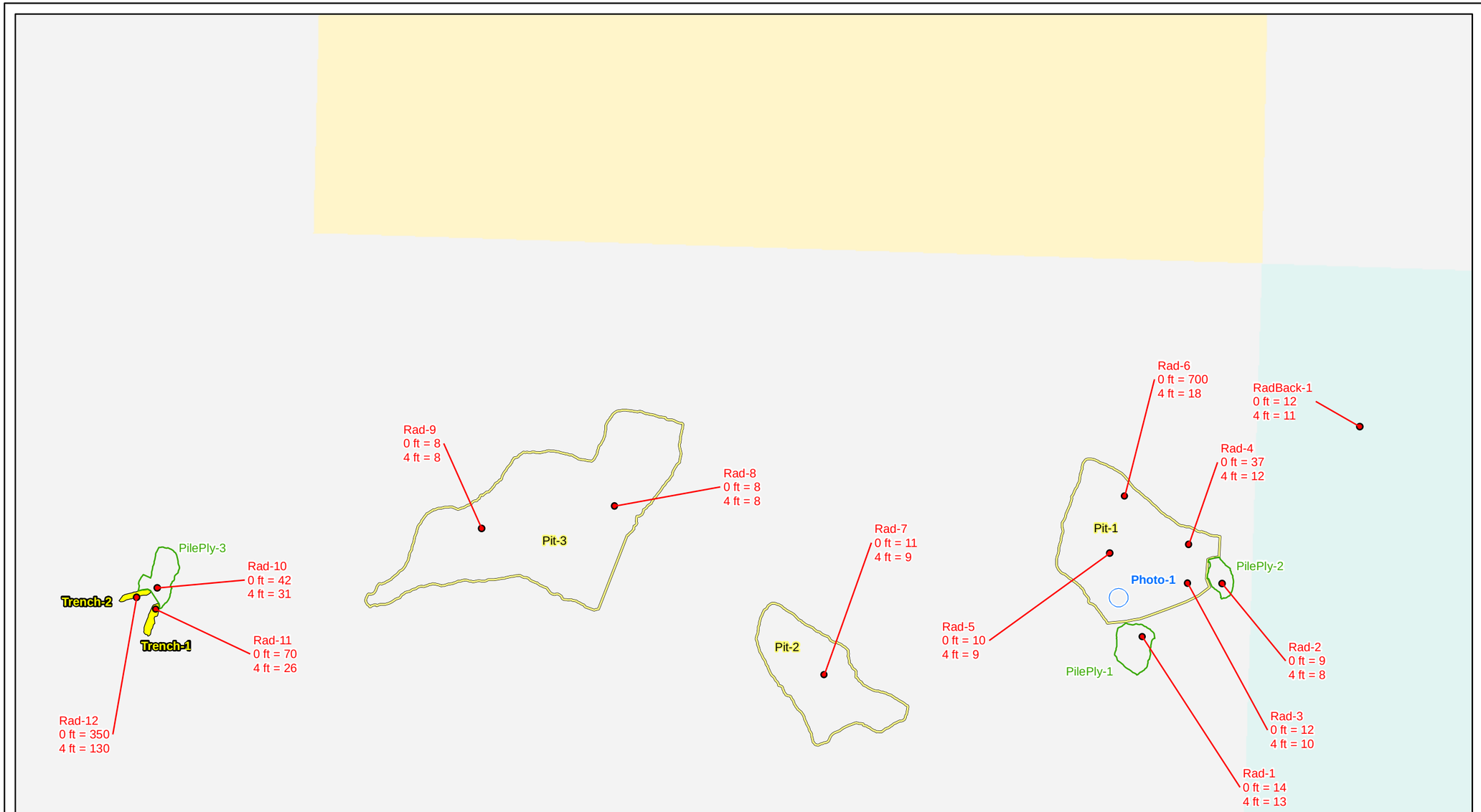


Legend

- Radiation Readings (µR/hr)
- Photo Location
- Pile Boundary
- Pit Boundary
- Trench

Surface Ownership

- Bureau of Land Management
- Private
- State

0 150 300 600
Feet

NORTH

Map Source(s):
Ownership - BLM, 2008

Figure 4b
Site Map with
Surface Ownership
NM0103-Haystack
Section 31
Abandoned Uranium
Mine Assessment

APPENDIX A

PHOTO LOG

Note: Gaps in the numbering sequence of the photos is the result of removing photos not suitable for the report. A full set of photos is provided in the electronic deliverable.

Photo 1- Looking northeast at Site location photo.

Photo 2- Looking west at PilePly-1.

Photo 3- Looking east at PilePly-1.

Photo 4-Looking north at Pit-1.

Photo 5-Looking north PilePly-2.

Photo 6-Looking south at Pit-1.

Photo 7-Looking east from the north end of Pit-1.

Photo 8-Closeup of rock at Rad-6. High radiation levels were found near the small, black inclusions in this rock.

Photo 9-Looking south at Pit-2.

Photo 10-Looking north at Pit-2.

Photo 11-Looking east at Pit-3.

Photo 12-Looking northwest at Pit-3.

Photo 13-Looking east at PilePly-3.

Photo 14-Looking east at Trench-1.

Photo 15-Looking south at Trench-2.

Photo 16-Vegetation at AUM Site.

Photo 17-Vegetation at AUM site.

Photo 18-Vegetation at AUM site.

Photo 19-Vegetation at AUM site.

Photo 20-Vegetation at AUM site.

APPENDIX B

FIELD NOTES

9/17/10 ALT Abandoned Uranium Mines

Site Name: NM0103, Haystack Section 31

Objective: Site Assessment

Personnel: Annelia Tinklenberg
Spencer Whitman

Equipment: Rental truck, Trimble Geo XM (SN: 4948447 27, 2008 Series), Ludlum 192 (SN: 234149), Fujifilm digital camera (NO. OTB31259)

1245 At the AUM Polygon.

~~PilePly~~ ALT

Photo 1 - Site location looking northeast
Pit PilePly-1 - 10' tall, ~~450~~ 300' wide, ~~800~~ 400' long; waste rock
Photo 2 - PilePly-1 looking west
Photo 3 - PilePly-1 looking east

Photo 4 - Pit 1 looking north

PilePly-1 - 5' tall, 40' wide, 80' long; 25° slope waste rock
Rad-1 - PilePly-1; 0m - 14 uR/h; 1m - 13 uR/h

PilePly-2 - 10' tall, 40' wide, 60' long, ~~40~~ 45° slope waste rock
Photo 5 - PilePly 2 looking north
Rad-2 - PilePly-2; 0m - 9 uR/h; 1m - 8 uR/h
Rad 3 - Pit-1; 0m - 12 uR/h; 1m - 10 uR/h
Rad-4 - Pit-1, 0m - 37 uR/h; 1m - 12 uR/h; outcrop
Rad-5 - Pit-1; 0m - 10 uR/h; 1m - 9 uR/h

Photo 6 - Pit-1 looking south
Photo 7 - Pit-1; north end looking east
Rad 6 - Pit-1; 0m - 700 uR/h; 1m - 18 uR/h
Photo 8 - Rad 6

9/17/10 ALT Abandoned Uranium Mines

Pit-2 - 10' deep; 150° wide, 400' long; 40° slope
Photo 9 - Pit-2 looking south
Photo 10 - Pit 2 looking north
Rad 7 - Pit-2; 0m - 11 uR/h; 1m - 9 uR/h

Pit 3 - 20' deep; 200° wide, 500' long
Photo 11 - Pit 3 looking east
Photo 12 - Pit 3 looking northwest
Rad 8 - Pit 3; 0m - 8 uR/h; 1m - 8 uR/h
Rad 9 - Pit 3; 0m - 8 uR/h; 1m - 8 uR/h
PilePly-3 - waste rock; 5' tall; 40' wide; 90' long; 40° slope
Photo 13 - PilePly 3 looking east
Rad-10 - PilePly 3; 0m - 42 uR/h; 1m - 31 uR/h

Trench-1 - 3' deep, 10' wide, 60' long
Photo 14 - Trench-1 looking east
Rad 11 - Trench-1; 0m - 70 uR/h; 1m - 26 ~~uR/h~~ ALT uR/h

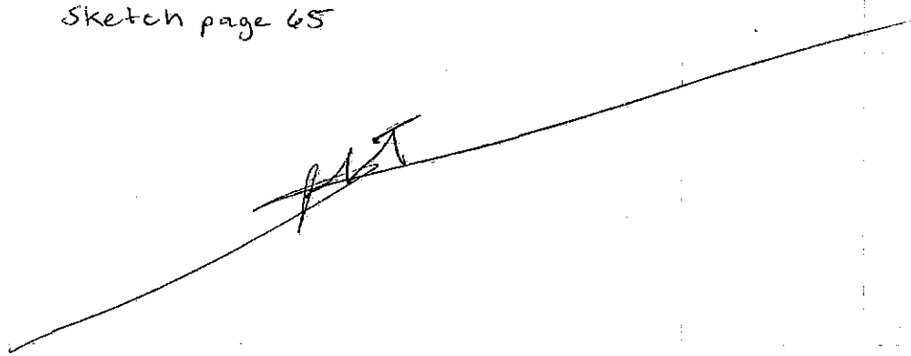
Trench-2 - 3' deep, 12' wide, 50' long
Photo 15 - Trench-2 looking south
Rad 12 - Trench 2; 0m - 350 ~~uR/h~~; 1m - 130 uR/h

1500 Background Rad - 0m - 12 uR/h; 1m - 11 uR/h

Photos 16 - 20 - Vegetation

Soils: Tan sandy soils; locally gray.
Rocks: Tan Dakota sandstone, Grey sandstone, Todito?
Wildlife: Jackrabbit, ravens. Deer and rabbit droppings.
Human Activities: Cow prints and droppings and fences indicate grazing.

Sketch page 65



65 9/17/10 ACT Abandoned Uranium Mines